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Cercarial development of *Fasciola* within the intermediate snail host *Lymnaea acuminata* from river waters of Aurangabad (M.S.) India

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Abstract

Collection of snail specimens of *Lymnaea acuminata* was done from river water around the city Aurangabad. Naturally infected snails were identified and dissected in order to study the cercarial development within the snail body. Infected gonads were collected and got processed for general histological study in order to investigate cercarial development. Light microscopic observations of the gonadal sections show various stages of cercarial development within redia of liver fluke, *Fasciola*. Redia are formed after completion of the sporocyst development. Fully developed rediae are polymorphic shaped sacks having mouth opening at the anterior end. Just behind the collar region at one site there is presence of birthpore which acts as an exit for developing cercaria. From the germinal layer proliferation of germ balls take place vegetatively. At the initial stages of germball development, it is simple ball of cells. On further development it becomes elongated with mesenchyme tissue.Advancement in further development, there starts the formation of digestive system with distinct intestinal lobes or caecae. During post developmental stages there is appearance of pharynx, suckers and tail of cercaria. It seems that cercaria move towards anterior region with progress in their development. Fully developed cercaria having distinct tail gets birth through birthpore.

Keywords: Parasitised snails, sporocyst, rediae, cercaria, birthpore.

INTRODUCTION

The digenean trematodes have two host life cycles involving a snail as an intermediate host and other specific definitive vertebrate host. The freshwater snail *Lymnaea acuminata* found infected with 3 to 4 different trematode larval pathogens in different specimens or occasionally found infected with two different pathogens in the same snail. The liver fluke *Fasciola* frequently found infecting the snail *L. acuminata* snail population from the river waters around the city Aurangabad. This parasite is widely distributed throughout the world and considered as cosmopolitan species infesting a wide range of wild and domestic animals as is the case with echinostomatids [4]. Infection to the intermediate molluscan host by trematode pathogens caused either after feeding fertilized ova or directly penetration of miracidia through snails intestine. McCoy [6] succeeded in feeding ova of *Reniferkansensis, Dasymetraconferta* and *Pneumatophilus variabilis* and obtained the corresponding cercariae of these three species. Ingels [3] indicated that the miracidia of *Zeugorchis syntomentera* penetrated directly through the snails intestine and become sporocyst. Faust and Khaw [2] studied the successive intra molluscan developmental stages of *Clonorchis sinensis* (Cobbold) hatch only after ingestion by the appropriate snail host. Vogel [11] while describing the life cycle of *Opisthorchis felineus* Revolta, 1884 stated that the egg is fully developed at the time of ovoposition and the miracidia has no free living existence , but is hatched in the intestine after the ingestion of the egg by the snail host *Bithymia leachi* Shepp. Investigation on developmental stages of digenean trematodes were made by various workers viz. sporocyst and cercaria produced in *Physa gyrina* and cercariae of *Schistosoma mansoni*. Very recently, morphological studies were made on cercaria produced from *Melanoides tuberculata* snails in Egypt [13] and in another prosobranch snail, *Mehanopsis praemorpha* from freshwater bodies in Palestine. In the life cycle of the digenetic trematodes the redial stage is a very important step, it represent a form of resistance to unfavorable environmental condition raising generations of daughter redia during intramolluscan development. Histopathological study of the redai and cercariae of *Fasciola hepatica* [7] and Stereoscan studies of rediae, cercariae, cyst, excysted metacercariae and migratory stages of *F. hepatica* [5] are well documented. In the present investigation an attempt has been made histologically to study cercarial development in the freshwater snail *L.acuminata* naturally infected by digenean trematode larval pathogens.

MATERIAL AND METHODS

The freshwater Lymnaeid snail *Lymnaea acuminata* was collected from the freshwater bodies around the city Aurangabadand maintained in the glass aquaria at laboratory conditions. Food material consisting of aquatic algae *Spirogyra* and other aquatic weed was provided *ad labium*. Individual snail species were observed under binocular dissecting microscope in order to identify and get sorted infected snail species.Infected snails were dissected and larval pathogens invaded body component, specially hepatopancreatic - gonadal complex was removed and fixed in aqueous Bouin's fluid for further histological study. Tissues were

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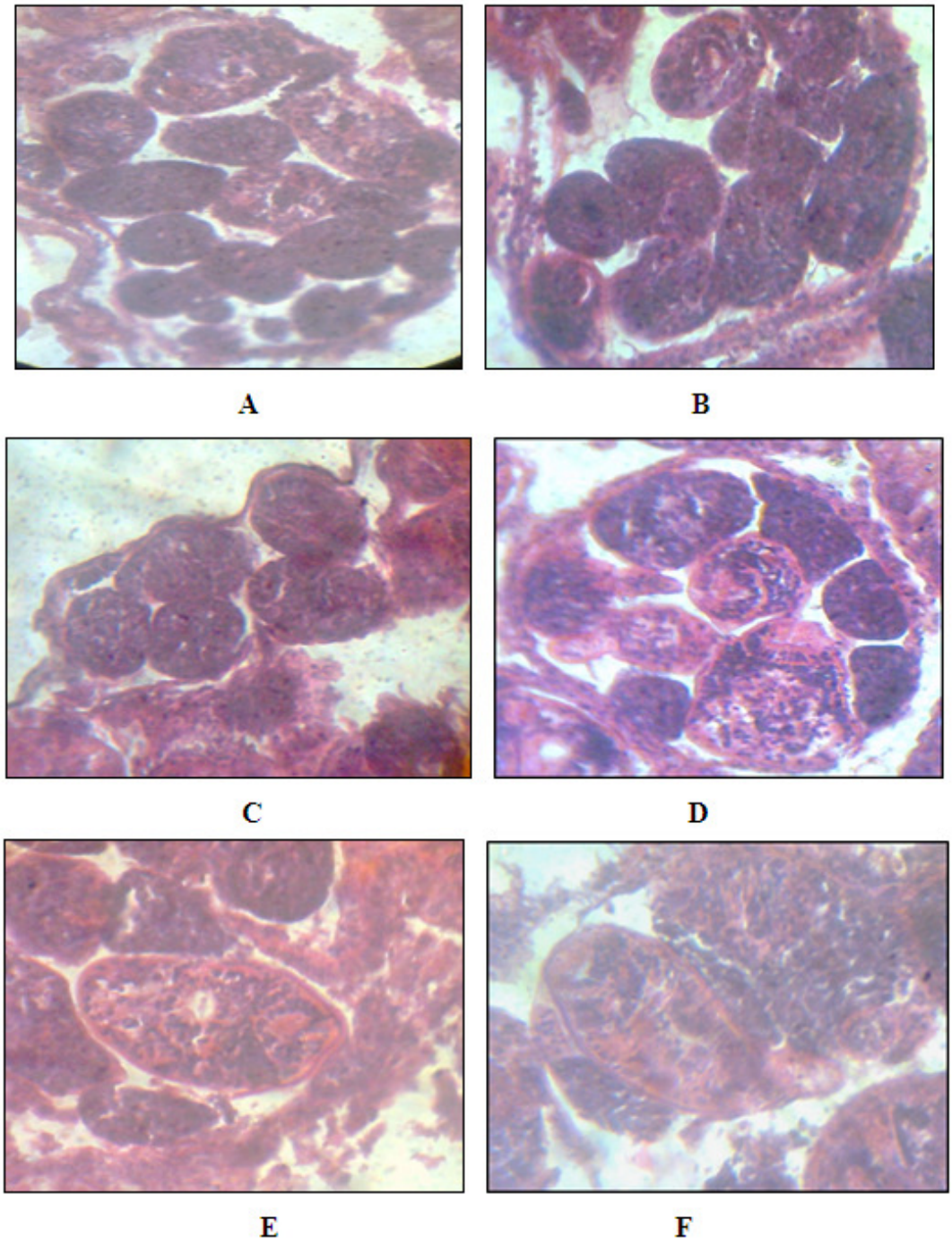
passed through various increasing grades of ethanol, blocks were prepared after getting cleared in xylol. Serial sections were cut at 7-9µthickness and were stained in Ehrlich's haematoxylen-eosin staining method. DPX mounted serial sections were observed under light microscope in order to study different stages or steps of cercarial growth and development , right from the proliferation of germ balls to fully developed cercaria within the rediae found in the hepatopancreatic - gonadal complex of the snail *L.acuminata*. The results are depicted in the form of microphotographic plates.

OBSERVATION AND RESULTS

The hepatopancreatic- gonadal complex of the snail was found fully loaded with various stages of digenetic trematode pathogens, such as sporocyst, cercaria and rediae. Attention has been paid on the rediae and cercarial development within. Fully developed rediae were found in the peripheral region of the hepatopancreatic tubules. The cercarial development commences with proliferation of germ ball from granular cell called 'propagative cell' of the muscular process of rediae present in the posterior region. The proliferated germ balls lie freely in the cavity of redia and apparently did not retain any connection with the muscular wall of the redia. The germ ball is granular rounded cell measuring 1-2µm diameter. With the result of mitotic division thereby gets converted into multicellular rounded structure, from which develop further cercaria. These progressive germ balls measure 5-8 µm found freely within matrix of redia. (see plates A,B and C).



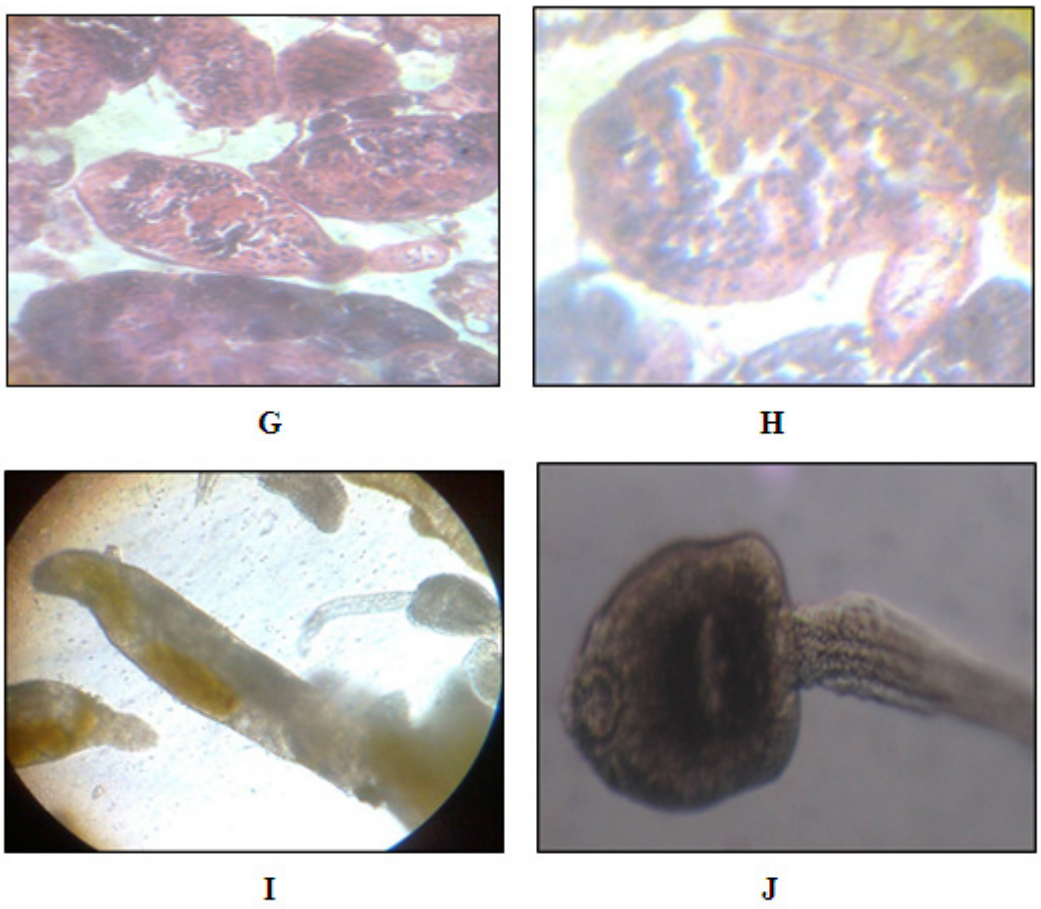


Fig A – C. **Showing Advancement in the Germ Balls Development.**
Fig D & E. **Showing Sucker Development.**
Fig F- H. **Showing Tail Development.**
Fig I &J **Fully Developed New Born Cercaria.**

With the advancement in the further growth of these germ balls, become elongated (30-50µ m) and then differentiation of tissue occurs. There is appearance of darkly stained Basophiliais observed in the cell at the anterior region i.e. ganglionic nervous tissue. With the progress in cercarial development there starts appearance of anterior and ventral suckers, the digestive system with distinct pharynx and bifurcated intestinal caecae surrounding laterally one on either side of the ventral sucker, acetabulum.

At the verge of completion of cercarial development there is appearance of tail bud (see plate E and F) inthe posterior extremity of the body of cercaria. The fully developed cercaria has distinct body and elongated tail region. These progressive cercariae move toward the anterior words and find exit through birth- pore present at the left side just behind pharynx slight ventrally. Furtherfully developed cercaria are shed or released from the snail body into the surrounding water at free swimming stage.

DISCUSSION

Molluscs are regularly found harbouring larval stages of digenetic trematodes [8]. The hepatopancreatic –gonadal complex of *L. acuminata* is a major site of infection by larval trematode pathogens. Fully developed rediae of *Fasciolaare* present in the peripheral part of the infected aforementioned tissue of the snail. In the life cycle of digenetic trematode the radial stage is a very important step from various aspects of parasitology. The snail *Lymnaea* is also a good model as an intermediate host for the study of life cycles of various trematode parasites. Ample of literature is available and which deals with morphological aspects of cercaria [13] host parasite relationship [1] and pathological lessions caused to vector snails due to schistosome infection [9]. Literally, scant information is available on embryonic development and growth of various stages of larval trematodes involved in the life cycle. With this impetus the present sincere attempt has been made on cercarial growth and development in the naturally infected specimens of *Lymnaea*. Far past in this regard Walker [12] made experimental studies on trematodes belonging to the sub- family Reniferinae. He made sincere attempt right from inoculation of non-incubated eggs of *Reniferaniarum* in the parasite free snail, *Physahalei* and observed histologically further development of trematode larval pathogen up to the stage of daughter sporocyst in the snail body. Talbot [10] stated that the ova of *Lechriorchis primus* are ingested by the snail host, hatch in the stomach, “the miracidium actively penetrates the stomach wall and comes to rest along the surface of the digestive tract, where metamorphosis into mother sporocyst occurs.” The present findings also are in agreement with the Talbot, since mature rediae with fully developed cercariae within are located in the peripheral part of the digestive gland, hepatopancreas and even emerging cercariae are present just beneath the casule layer surrounding the hepatopancreas.

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